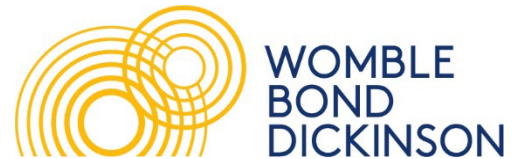


EXHIBIT C

womblebonddickinson.com



May 2, 2023

Womble Bond Dickinson (US) LLP

Barnes & Thornburg LLP
Attn: Kurt W. Rohde
One North Wacker Drive, Suite 4400
Chicago, IL 60606
Via E-mail: kurt.rohde@btlaw.com
Phone: 312-759-5646

271 17th Street, NW
Suite 2400
Atlanta, GA 30363-1017

t: 404.872.7000
f: 404.888.7490

Re: Foreman.mn software

Rodney R. Miller, Partner
Direct Dial: 404-879-2435
E-mail: Rodney.Miller@wbd-us.com

Dear Mr. Rohde,

I write on behalf of my client, OBM, Inc., concerning your April 3, 2023 letter. OBM reached out to Ian Rock, Lancium's Vice President IT Operations, and other representatives at Lancium as requested in your letter, to discuss potential commercial opportunities between OBM and Lancium. Based on my client's initial discussions with Lancium, it does not appear as if Lancium's representatives are prepared to have a productive, timely conversation as your letter requests. Nevertheless, thank you for attempting to facilitate this discussion on behalf of your client. It's unfortunate that our clients have not been able to move these discussions as quickly as your letters suggests was desired.

In addition to requesting that my client reach out to Lancium, your letter also generally references the over 25 patents Lancium has obtained that allegedly relate to power grid balancing and stabilizing technologies Lancium allegedly developed. Of note, your letter does not reference or explain how any of these over 25 patents are specifically relevant to OBM's Foreman Software or how OBM's Foreman Software practices any of the claims of these patents. Such overly broad statements made it difficult for OBM to properly evaluate the relevancy or value of Lancium's entire patent portfolio. Nevertheless, we reviewed multiple patents assigned to Lancium on the PTO database and did not identify any patents that were relevant to OBM's current software offering. We will address, however, U.S. Patent No. 10,608,433 ("the '433 patent") since your letter appears to suggest that my client's Foreman Software possibly relates to the subject matter claimed in this patent.

Based on our review the '433 patent, the Foreman Software does not practice any claim of the '433 patent. For example, independent claims 1, 17, and 20 require: (1) the receipt of power option data based on a power option agreement; (2) that the power option data specify a set of minimum power thresholds associated with time intervals; and (3) the determining of a power option strategy based on power consumption target that is equal to or greater than the minimum power threshold associated with each time interval. First, the Foreman Software does not receive the "power option data" as described and required by claims 1, 17, and 20. Specifically, the Foreman Software receives neither power option data based on a power option agreement nor a set of minimum power thresholds associated with time intervals. Second, the Foreman Software does not determine a power option strategy based on power consumption target that



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is equal to or greater than the minimum power threshold associated with each time interval. OBM has no interest in implementing the technology claimed in the '433 patent in its software offering.

Further, during our review of the '433 patent, we uncovered two prior art references that appear to anticipate, at minimum claim 1, of the '433 patent. I have attached for your convenience charts that map exemplary language in the prior art reference to each element of claim 1.

Given the validity concerns regarding the '433 patent and lack of relevance of Lancium's patents to OBM's current software offering, OBM is unclear on the relevancy of any potential patent licensing or commercial opportunities with Lancium at this time. This is compounded by the fact that Lancium has not made a licensing proposal to my client. If, in the future, Lancium decides to make such a licensing proposal, which OBM determines is commercially relevant, OBM would welcome such discussions.

Best regards,

Womble Bond Dickinson (US) LLP

A handwritten signature in black ink, appearing to read "Rodney R. Miller", written in a cursive style.

Rodney R. Miller

Attachment



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Attachment A

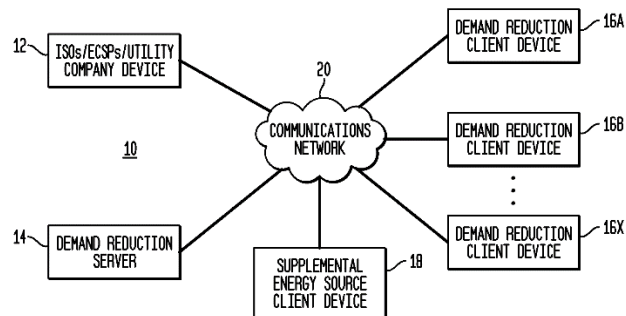
U.S. Patent Publication No. 20100088261

U.S. Patent No. 10.608,433	U.S. Patent Publication No. 20100088261
<p>A system comprising: a set of computing systems, wherein the set of computing systems is configured to perform computational operations using power from a power grid;</p>	<p>Abstract: For power management in a disaggregated computing system, a set of initial electrical power levels are allocated to a set of processor cores according to a predicted desired workload, where the set of initial power levels aggregate to an initial collective contracted power level. Electrical power is dynamically allocated to respective processor cores within the set of processor cores to produce a capacity to execute a collective demanded workload while maintaining the electrical power to the set of processor cores to an approximately constant electrical power level within a threshold of the initial collective contracted electrical power level.</p> <p>[0055] FIG. 1 is an exemplary system 10 for implementing fully automated demand response, in real time or substantially real time, at one or more end users without human involvement, in accordance with an aspect of the present invention. Referring to FIG. 1, the system 10 may include a computer 12, a demand reduction server computer ("DR server") 14, demand reduction client devices ("DR clients") 16 and a supplemental energy source client device ("SES client") 18. Each of the computers 12 and 14, the DR clients 16 which for purposes of the exemplary illustrated embodiment are computers, and the SES client 18 has communication capabilities and may be communicatively coupled to a communications network 20.</p> <p>[0056] As discussed in detail below, the computer 12 may be operated by ISOs and/or their affiliates, such as ECSPs, utility companies and the like, to transmit, over the network 20, electronic message data to the DR server 14 and the DR clients 16. Further, the DR server 14 transmits data to and receives data from the DR clients 16, and optionally the SES client 18, via the network 20, to implement fully automated demand response at end users with which the DR clients are associated, in accordance with the terms of DR Agreements to which the end users are parties.</p>



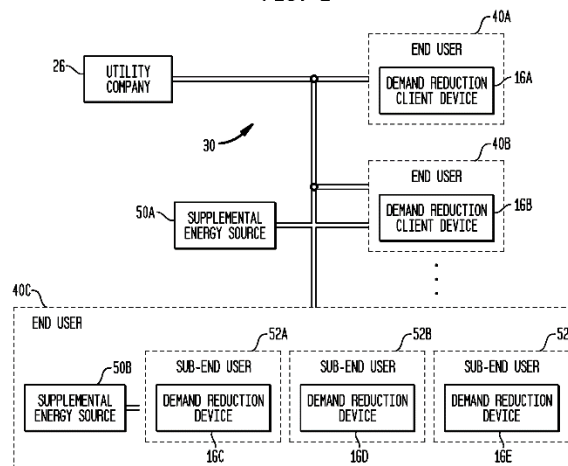
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FIG. 1



[0057] Further referring to FIG. 2, in an exemplary embodiment, a utility company 26, who is an operator or affiliate of an operator of the computer 12, may supply electrical power over a power grid 30 to end users 40A, 40B and 40C, who are customers of, and consume electrical power supplied over the grid 30 by, the utility company 26. In addition, supplemental energy sources 50 may be controlled, for example, by the DR server 14 or the DR clients 16 who communicate with the SES clients 18 respectively associated with the sources 50, to generate and supply supplemental electrical power to the end users 40.

FIG. 2



a control system configured to:
monitor a set of conditions;

[0069] In addition, for each end user, the data 106 includes monitoring data that may be used by the processor 100 to determine a demand reduction action to be taken for a DR event. The monitoring data may include, for each end user, historical and real time exterior environmental data; historical



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and real time interior environmental data; historical and real time energy consumption data describing consumption of electrical power supplied from the power grid or from a supplemental energy source; historical and real time energy generation data describing generation of electrical power from a supplemental energy source that may be controlled to supply supplemental electrical power to be consumed by an appliance at the end user; real time energy device operation information describing the operating status of appliances at the end user and the operating status of supplemental energy sources for supplying supplemental electrical power to the end user, which includes whether the energy devices are “ON” and “OFF” and also the mode of operation of the energy devices. For example, the monitoring data may include html documents acquired from or supplied by third parties over the network 20 which including current weather and next day weather information for a geographical area local to an end user.

[0070] Further, the monitoring data may include change information representative of changes to thresholds associated with appliance operation at an end user that may be supplied from the end user, such as via the DR client 16, after the DR Agreement has been established. This threshold information may include environmental limits, such as a maximum temperature within an interior of a facility (“space temperature”) of the end user, electricity pricing limits and times when certain appliances cannot be turned off. In one embodiment, the change information is supplied before a DR event, or alternatively during the course of a DR event, such as when an end user decides to partially or fully opt out of a DR event and input data is supplied that operation of selected or all appliances at the end user not be controlled, for example, turned OFF, during a DR event.

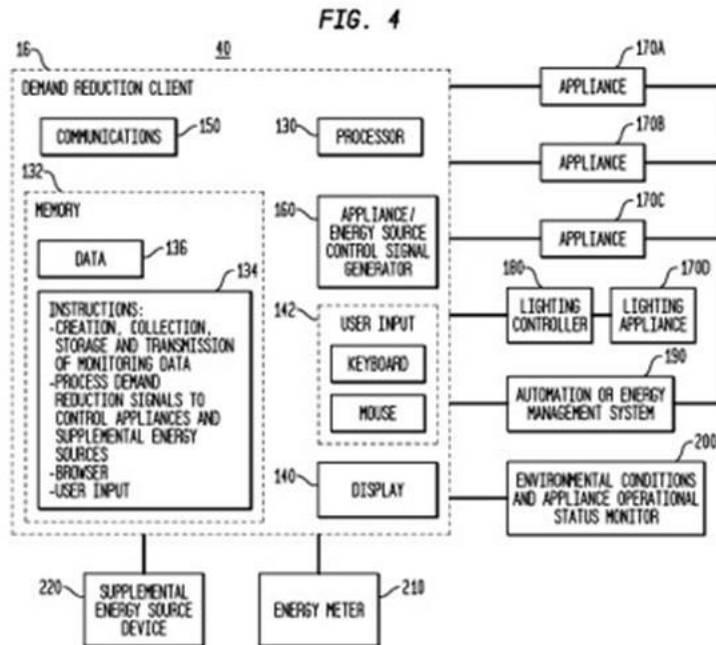
[0082] Referring to FIG. 4, in one embodiment an end user 40 may include a DR client 16 which is electrically and/or communicatively connected to appliances 170, a lighting controller 180 which is electrically connected to a lighting appliance 170D, and an automation control or energy management system 190 which is electrically connected to some or all of the appliances of the end user 40.

[0086] The instructions 134 of the DR client 16 may include instructions that the processor 130 may execute to create monitoring data from information supplied to the DR client 16, or acquired by the DR client 16 from, the monitor 200, the meter 210, the SES client device 220 and the appliances 170; to store all or portions of the monitoring data in the data 136;



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and to transmit the monitoring data, in real time or substantially real time, over the communication network 20 to the DR server 14.



[0128] Referring again to FIG. 5, in block 312, the processor 100 of the DR server 14 continuously evaluates the monitoring data, such as for the appliances 170 on which demand reduction actions are being implemented, during the DR event and determines, desirably using artificial intelligence, whether the demand reduction actions should continue to be implemented, or alternative demand reduction actions should be determined and implemented in place or together with the demand reduction actions being implemented, to ensure that the demand load reduction strategies in the DR Agreement for the end user are maintained.



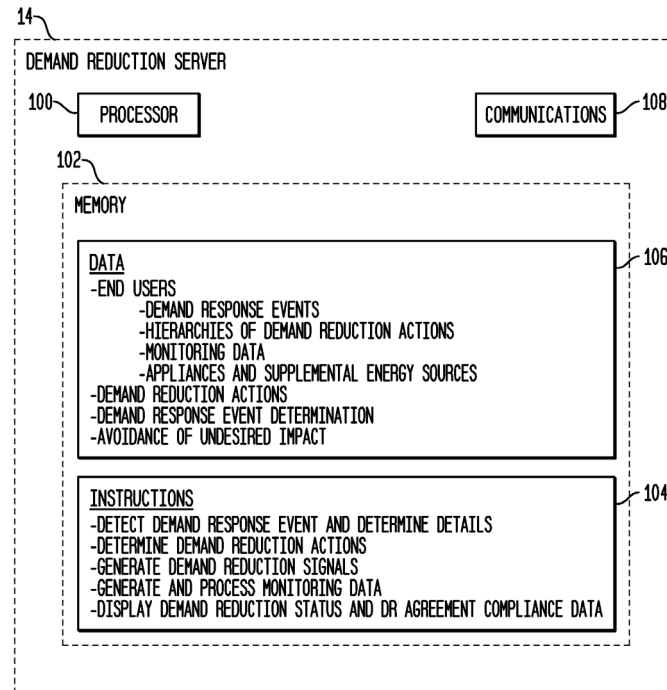
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	<p style="text-align: center;">FIG. 5</p> <p style="text-align: center;"><u>300</u></p> <pre> graph TD 302[DETECT DEMAND RESPONSE EVENT] --> 304[COLLECT AND CREATE MONITORING DATA RELATING TO END USER] 304 --> 306[DETERMINE DEMAND RESPONSE ACTION(S) FOR END USER ACCORDING TO DEMAND RESPONSE OBJECTIVES FOR DEMAND RESPONSE EVENT, HIERARCHY OF DEMAND REDUCTION ACTIONS FOR DEMAND RESPONSE EVENT FOR END USER AND MONITORING DATA FOR END USER] 306 --> 308[GENERATE DEMAND REDUCTION SIGNAL FOR DEMAND REDUCTION ACTION(S) AND TRANSMIT TO DEMAND REDUCTION CLIENT OF END USER AND/OR SUPPLEMENTAL ENERGY SOURCE(S)] 308 --> 310[IMPLEMENT DEMAND REDUCTION ACTION(S) AT END USER AND/OR SUPPLEMENTAL ENERGY SOURCE BASED ON DEMAND REDUCTION SIGNAL] 310 --> 312[EVALUATE MONITORING DATA RELATING TO END USER IN VIEW OF DEMAND RESPONSE EVENT AND, AS NEEDED, GENERATE AND TRANSMIT SUPPLEMENTAL CONTROL SIGNAL TO IMPLEMENT ADDITIONAL DEMAND REDUCTION ACTION(S) FOR END USER] </pre>
<p>receive power option data based, at least in part, on a power option agreement, wherein the power option data specify: (i) a set of minimum power thresholds, and (ii) a set of time intervals, wherein each minimum power threshold in the set of minimum power thresholds is associated with a time interval in the set of time intervals;</p>	<p>[0068] Referring to FIG. 3, the data 106 in the DR server may include information describing the terms of DR Agreements between end users and an ISO, utility company and/or ECSP to achieve KW demand reduction goals for particular DR events set forth in the DR Agreement. For each DR Agreement, the information in the data 106 describes those demand response events for which the end user agrees to reduce KW demand by implementation of one or more demand reduction actions; the demand reduction actions that the end user agrees may be implemented for a specific DR event; and a hierarchy or hierarchies indicating an order in which demand reduction actions are to be implemented for a specific DR event, where the demand reduction actions are ordered in the hierarchy or hierarchies to minimize an undesired impact at the end user during a DR event.</p>



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FIG. 3



[0128] Referring again to FIG. 5, in block 312, the processor 100 of the DR server 14 continuously evaluates the monitoring data, such as for the appliances 170 on which demand reduction actions are being implemented, during the DR event and determines, desirably using artificial intelligence, whether the demand reduction actions should continue to be implemented, or alternative demand reduction actions should be determined and implemented in place or together with the demand reduction actions being implemented, to ensure that the demand load reduction strategies in the DR Agreement for the end user are maintained.



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	<p style="text-align: center;">FIG. 5</p> <p style="text-align: center;"><u>300</u></p> <pre> graph TD 302[DETECT DEMAND RESPONSE EVENT] --> 304[COLLECT AND CREATE MONITORING DATA RELATING TO END USER] 304 --> 306[DETERMINE DEMAND RESPONSE ACTION(S) FOR END USER ACCORDING TO DEMAND RESPONSE OBJECTIVES FOR DEMAND RESPONSE EVENT, HIERARCHY OF DEMAND REDUCTION ACTIONS FOR DEMAND RESPONSE EVENT FOR END USER AND MONITORING DATA FOR END USER] 306 --> 308[GENERATE DEMAND REDUCTION SIGNAL FOR DEMAND REDUCTION ACTION(S) AND TRANSMIT TO DEMAND REDUCTION CLIENT OF END USER AND/OR SUPPLEMENTAL ENERGY SOURCE(S)] 308 --> 310[IMPLEMENT DEMAND REDUCTION ACTION(S) AT END USER AND/OR SUPPLEMENTAL ENERGY SOURCE BASED ON DEMAND REDUCTION SIGNAL] 310 --> 312[EVALUATE MONITORING DATA RELATING TO END USER IN VIEW OF DEMAND RESPONSE EVENT AND, AS NEEDED, GENERATE AND TRANSMIT SUPPLEMENTAL CONTROL SIGNAL TO IMPLEMENT ADDITIONAL DEMAND REDUCTION ACTION(S) FOR END USER] </pre>
<p>responsive to receiving the power option data, determine a performance strategy for the set of computing systems based on a combination of at least a portion of the power option data and at least one condition in the set of conditions, wherein the performance strategy comprises a power consumption target for the set of computing systems for each time interval in the set of time intervals,</p>	<p>[0076] Further, the instructions 104 may include instructions that the processor 100 may execute to determine one or more demand reduction actions to be implemented for a detected DR event at an end user, based on the end user DR Agreement data 106 included in the memory 102. The determination of the demand reduction action is based on the objectives and details included in the electronic message data for the DR event, and the data 106 of hierarchies of demand reduction actions, the monitoring data, and the appliance and supplemental energy source data, and the end user specified objectives or thresholds for KW demand reduction. In one embodiment, the instructions 104 may include instructions to achieve a KW demand reduction goal for a DR event at an end user by determining a demand reduction action using artificial intelligence and/or fuzzy logic and/or neural networks</p>



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<p>wherein each power consumption target is equal to or greater than the minimum power threshold associated with each time interval; and</p>	<p>according to the hierarchies and to avoid undesired impact at the end user.</p> <p>[0077] Also, the instructions 104 may include instructions that the processor 100 may execute to generate demand reduction action signals to be transmitted by the communications device 108. These demand reduction action signals may be transmitted to (i) a DR client 16 to provide for control operation of appliances at an end user by the DR client 16, and (ii) a SES device 18 to provide for control of generation and supply of supplemental electrical power to the end user from a supplemental energy source, during the course of a DR event.</p>
<p>provide instructions to the set of computing systems to perform one or more computational operations based on the performance strategy.</p>	<p>[0076] Further, the instructions 104 may include instructions that the processor 100 may execute to determine one or more demand reduction actions to be implemented for a detected DR event at an end user, based on the end user DR Agreement data 106 included in the memory 102. The determination of the demand reduction action is based on the objectives and details included in the electronic message data for the DR event, and the data 106 of hierarchies of demand reduction actions, the monitoring data, and the appliance and supplemental energy source data, and the end user specified objectives or thresholds for KW demand reduction. In one embodiment, the instructions 104 may include instructions to achieve a KW demand reduction goal for a DR event at an end user by determining a demand reduction action using artificial intelligence and/or fuzzy logic and/or neural networks according to the hierarchies and to avoid undesired impact at the end user.</p> <p>[0077] Also, the instructions 104 may include instructions that the processor 100 may execute to generate demand reduction action signals to be transmitted by the communications device 108. These demand reduction action signals may be transmitted to (i) a DR client 16 to provide for control operation of appliances at an end user by the DR client 16, and (ii) a SES device 18 to provide for control of generation and supply of supplemental electrical power to the end user from a supplemental energy source, during the course of a DR event.</p> <p>[0087] In addition, the instructions 134 may include instructions that the processor 130 may execute to process data included in demand reduction action signals received from the DR server 14 and, in turn, provide for generation of energy device control signals and/or control data by the generator 160 and output of such control signals and/or control data to the appliances 170 and the SES client 220 to control operation, respectively, of the appliances 170 and a supplemental energy</p>



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source(s), such as the source 50B, associated with the SES device 220.

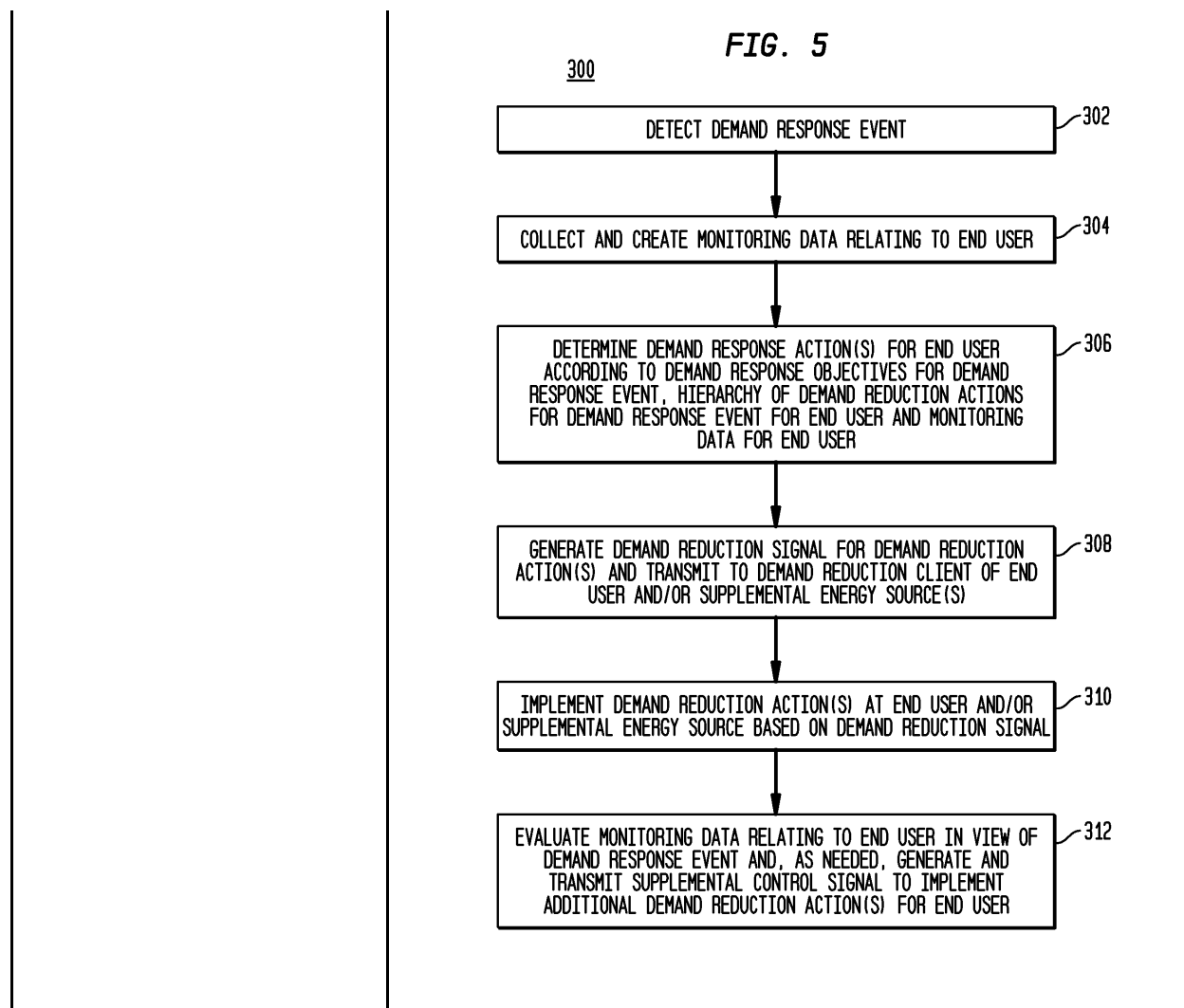
[0088] In addition, the instructions 134 may include instructions that the processor 130 may execute to process signals and/or electronic data received directly from an ISO, utility company and/or ECSP, and, in turn, provide for generation of energy device control signals and/or control data by the generator 160 and output of such control signals or control data to selected appliances 170 to control their operation.

[0089] Also, the instructions 134 may provide for generation of control signals at the generator 160 that may be supplied to the lighting controller 180 or the management system 190 to have the controller 180 or the system 190, in turn, control operation, respectively, of the lighting appliances 170D and one or more of the appliances 170.

[0128] Referring again to FIG. 5, in block 312, the processor 100 of the DR server 14 continuously evaluates the monitoring data, such as for the appliances 170 on which demand reduction actions are being implemented, during the DR event and determines, desirably using artificial intelligence, whether the demand reduction actions should continue to be implemented, or alternative demand reduction actions should be determined and implemented in place or together with the demand reduction actions being implemented, to ensure that the demand load reduction strategies in the DR Agreement for the end user are maintained.



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U.S. Patent Publication No. 20180101220

U.S. Patent No. 10,608,433	U.S. Patent Publication No. 20180101220
A system comprising: a set of computing systems, wherein the set of computing systems is configured to perform computational operations using power from a power grid;	<p>[0002] The present invention relates generally to large scale computing, and more particularly to power management in a disaggregated computing environment.</p> <p>[0006] Various embodiments for power management in a disaggregated computing system, by a processor device, are provided. In one embodiment, a method comprises allocating a set of initial electrical power levels to a set of processor cores in the disaggregated computing system according to a predicted desired workload, wherein the set of initial electrical power levels aggregate to an initial collective contracted electrical power level; and dynamically allocating electrical power to respective processor cores within the set of</p>



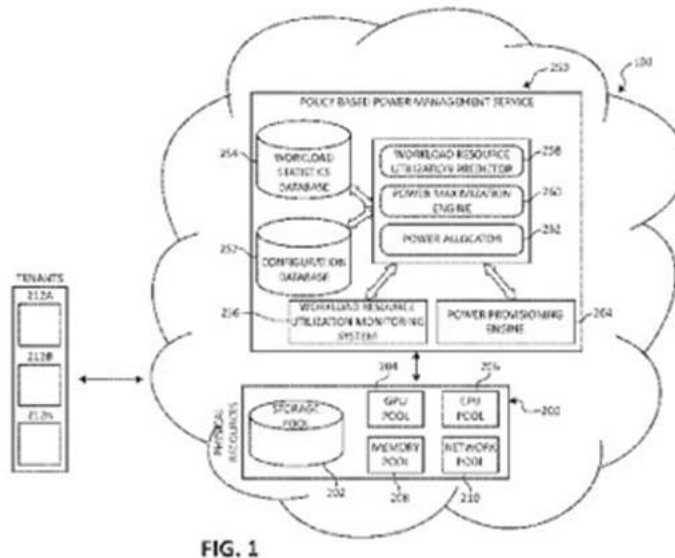
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processor cores to produce a capacity to execute a collective demanded workload while maintaining the electrical power to the set of processor cores to an approximately constant electrical power level within a threshold of the initial collective contracted electrical power level.

[0023] Second, given a range of electrical power allocated (contracted) from the utility company for a datacenter, it is highly desirable to operate within that allocated (contracted) power range with some small variance (e.g. +/-5 percent within the allocated power). Power is a valuable resource and utility companies have limited total power they can generate and carry over the power grid to supply. Utility companies cannot quickly adjust the generation of power to match fast and large fluctuations of power consumed. Therefore, it is imperative that a certain range of power usage that is contracted, be consumed by the data center. Utility companies need to balance electrical power generation with power consumption because their generators can adjust to periodic demands but cannot adjust for these large erratic power usage changes. When the datacenter erratically underutilizes the contracted power, the utility company may have to burn the extra power generated so that they do not damage their generators. Consequently, utility power supply contracts may stipulate that large variations in power usage by a customer (e.g., a datacenter operator) may lead to costly penalties in form of additional charges. Hence, it is not always beneficial to quickly move into sleep mode and save power only to quickly move back to need to use that power again.



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a control system configured to:
monitor a set of conditions;

[0049] In various described embodiments herein, the present invention uses existing prediction techniques to estimate a workload's demand and allocates available power, or removes the workload's allocated power (based on a workload priority), which would be wasted, otherwise. A total available power is monitored and tracked. Power is maintained at as small variations as possible from the contracted utility power for the datacenter. In some embodiments, the total power available is allocated to workloads in need based on the workload's priority to provide them an additional throughput boost, while keeping the overall utilization within the range power contracted for such datacenter. For example, increasing the voltage of processing cores running such a prioritized workload and thereby increasing the clock speed will use additional power, yet for a good cause (e.g. large data analytics that can be performed whenever higher priority workloads are not using power). If there is not sufficient total available power in the datacenter to match maximum contracted utility power while the workloads require additional power based on the predicted demand, the system removes the estimated surplus power and/or reduces the voltage allocated to some of the workloads (with lower priority) and allocates it to the higher prioritized workloads based on their predicted demand.



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[0042] The workload resource utilization predictor 258 models workload usage patterns based upon metrics collected from the workload resource utilization monitoring system 256, which is responsible for monitoring the utilization of each workload in the system. The power allocator 262 prepares power allocation instructions based on computations of the power maximization engine 260 and sending the power allocation instructions to the power provisioning engine 264. The power provisioning engine 264 invokes the instructions received from the power allocator 262 (i.e. increases or decreases power to processing cores of a particular workload or migrates freed-up processing components to a particular workload). The power maximization engine 260 receives input from the workload resource utilization predictor 258, and computes the various variables as previously defined.

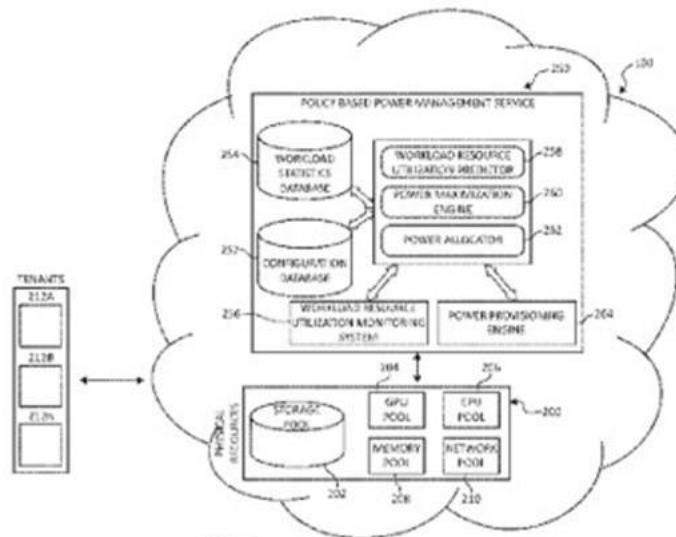


FIG. 1

receive power option data based, at least in part, on a power option agreement, wherein the power option data specify: (i) a set of minimum power thresholds, and (ii) a set of time intervals, wherein each

[0049] In various described embodiments herein, the present invention uses existing prediction techniques to estimate a workload's demand and allocates available power, or removes the workload's allocated power (based on a workload priority), which would be wasted, otherwise. A total available power is monitored and tracked. Power is maintained at as small variations as possible from the contracted utility power for the datacenter. In some embodiments, the total power available is



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minimum power threshold in the set of minimum power thresholds is associated with a time interval in the set of time intervals;

allocated to workloads in need based on the workload's priority to provide them an additional throughput boost, while keeping the overall utilization within the range power contracted for such datacenter. For example, increasing the voltage of processing cores running such a prioritized workload and thereby increasing the clock speed will use additional power, yet for a good cause (e.g. large data analytics that can be performed whenever higher priority workloads are not using power). If there is not sufficient total available power in the datacenter to match maximum contracted utility power while the workloads require additional power based on the predicted demand, the system removes the estimated surplus power and/or reduces the voltage allocated to some of the workloads (with lower priority) and allocates it to the higher prioritized workloads based on their predicted demand.

[0050] The priority of the workloads is determined based on their SLAs, or other business rules, as assigned to tenants 212 a-n. By allocating the surplus power available and driving the total power available towards zero within the variation from what was nominally allocated, the system balances the total power consumed at the datacenter and matches more efficiently with the range of power that was actually contracted from the utility company.

[0051] The present invention therefore attempts to maximize the utilization of power contracted from utility companies rather than reducing power consumption, where SLAs or other business logic requirements are taken into consideration when maximizing the use of the power allocated. This is an important distinction from prior art, which primarily hibernates or powers down under-utilized servers to save power consumption. In another prior art, power is adjusted based on high/low usage but it does not focus on maximizing the use of the power allocated from the utility company by leveraging workloads with opportunistic SLAs to adjust the power delivery, while maintaining SLAs. Additionally, and at the same time, the disclosed invention also improves the utilization and throughput capacity of the deployed hardware and software at a datacenter.

[0052] As aforementioned, this functionality is achieved through a policy based power management service, which implements a technique to maintain the power utilization variation within the range allocated (contracted) by the utility company while maximizing such use of power and its utilization thereby achieving the desired workload throughput.



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This is uniquely achievable in a disaggregated computing system as processing components can be quickly switched from one workload to another and where large, disaggregated systems have the capability of driving many concurrent workloads. Hence, there are always workloads to be performed whether active or in suspended mode, as well as other workloads to be resumed, all of which may be triggered quickly within milliseconds of response time.

[0053] Using the aforementioned example, if a utility company has allocated (contracted) 10 megawatts of power with an acceptable 5% variation with no penalties for such variation of power use, then the datacenter is allocated a power range of 9.5-10.5 megawatts. Even though the range is acceptable, a datacenter with high capital investment would prefer to be on upper bound of the total power utilization (i.e. over-utilize rather than under-utilize), thus driving the total additional available power within the datacenter towards zero while maintaining a goal of executing the allowed 10.5 megawatts.

[0063] FIG. 3 illustrates a method 300 for power management in a disaggregated computing system. The method 300 may be performed in accordance with the present invention in any of the environments depicted in FIGS. 1 and 2, among others, in various embodiments. Of course, more or less operations than those specifically described in FIG. 3 may be included in method 300, as would be understood by one of skill in the art upon reading the present descriptions.

[0065] The method 300 begins (step 302) by allocating a set of initial electrical power levels to a set of processor cores in the disaggregated computing system according to a predicted desired workload, wherein the set of initial power levels aggregate to an initial collective contracted power level (step 304). Electrical power is dynamically allocated to respective processor cores within the set of processor cores to produce a capacity to execute a collective demanded workload while maintaining the electrical power to the set of processor cores to an approximately constant electrical power level within a threshold of the initial collective contracted electrical power level (step 306). The method ends (step 308).



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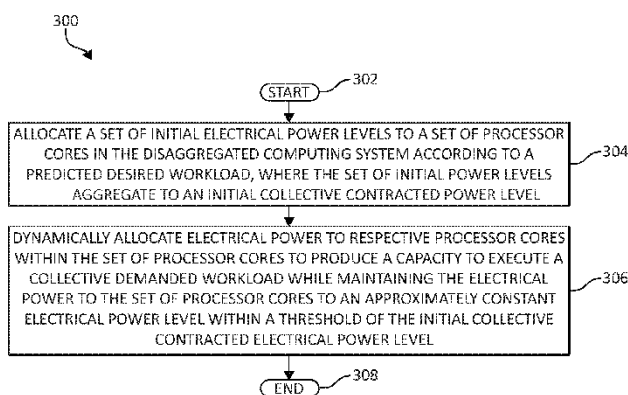


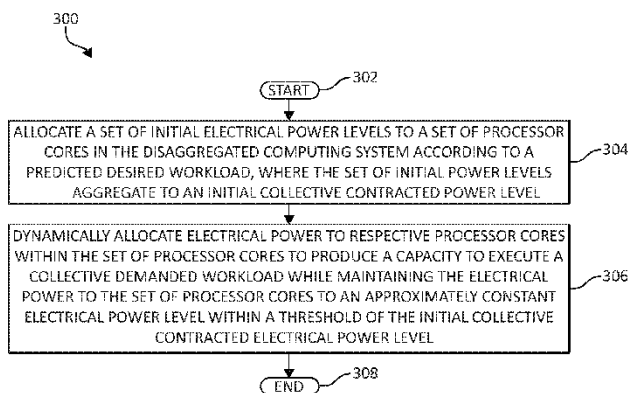
FIG. 3

responsive to receiving the power option data, determine a performance strategy for the set of computing systems based on a combination of at least a portion of the power option data and at least one condition in the set of conditions, wherein the performance strategy comprises a power consumption target for the set of computing systems for each time interval in the set of time intervals, wherein each power consumption target is equal to or greater than the minimum power threshold associated with each time interval; and

[0066] In some embodiments, the power management module 250 can prioritize workloads into different categories where each category includes ranges of allowed clock speed and voltage (e.g. High (clock speed range a-b); Medium (clock speed range c-d); Low (clock speed range e-j)). The power management module 250 may further dynamically adjust the range of each category (the voltage and the clock speed of the processors/processor cores) based on analysis of a usage pattern of the workloads and forecast of the clock speed requirements (e.g. some workloads may have seasonal or periodic pattern of resource utilization). Of course, a host of other categories and priorities may be used other than a “High, Medium, and Low” priority, category, or range depending on the actual implementation, as one of ordinary skill in the art would appreciate.



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provide instructions to the set of computing systems to perform one or more computational operations based on the performance strategy.

[0067] Further actions may perform re-categorizing a workload based on its usage requirements and forecast. For example, if a Low priority workload always requires a ceiling level of its clock speed range, then it should be re-categorized as a Medium priority workload. Conversely, if a High priority workload generally requires a lower level of its allowed range for clock speed, then it may be re-categorized as a Medium priority workload, and so on. Additionally, power may be assigned to certain workloads based on demand in order to increase performance (clock speed) of the processor/processor core by lowering the power and hence, clock speed of other, lower priority or lower demand workloads. Furthermore, the mechanisms of the power management module 250 may determine a more accurate amount of contract power for a next term from a prediction/forecast of priority distribution.



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